

CLAIMS

1. An ammonia gas sensor, comprising:
a reference electrode;
an ammonia selective sensing electrode comprising the reaction product
of
a main material selected from the group consisting of vanadium,
tungsten, molybdenum, vanadium oxides, tungsten oxides, molybdenum oxides, and
combinations comprising at least one of the foregoing main materials; and
an electrically conducting material selected from the group consisting of
electrically conductive metals, electrically conductive metal oxides, and combinations
comprising at least one of the foregoing; and
an electrolyte disposed between and in ionic communication with the
sensing electrode and the reference electrode.
2. The ammonia gas sensor of Claim 1, wherein the electrically
conductive material is selected from the group consisting of bismuth, lead, lanthanum,
strontium, calcium, copper, gadolinium, neodymium, yttrium, samarium, magnesium,
magnesium oxide, bismuth oxide, lead oxide, lanthanum oxide, strontium oxide,
calcium oxide, copper oxide, gadolinium oxide, neodymium oxide, yttrium oxide,
samarium oxide, and combinations comprising at least one of the foregoing electrically
conducting materials.
3. The ammonia gas sensor of Claim 2, wherein the main material
and electrically conducting material form a first material selected from the group
consisting of V_2O_5 , $BiVO_4$, WO_3 , MoO_3 , and combinations comprising at least one of
the foregoing first materials.
4. The ammonia gas sensor of Claim 2, wherein the sensing
electrode comprises about 0.1 at% to about 15 at% of the electrically conducting
material based on the whole sensing electrode.

5. The ammonia gas sensor of Claim 4, wherein the sensing electrode comprises about 1 at% to about 10 at% of the electrically conducting material.
6. The ammonia gas sensor of Claim 5, wherein the sensing electrode comprises about 3 at% to about 8 at% of the electrically conducting material.
7. The ammonia gas sensor of Claim 1, wherein the sensing electrode further comprises a chemically stabilizing dopant selected from the group consisting of tantalum, niobium, magnesium, tantalum oxide, niobium oxide, and magnesium oxide, and combinations comprising at least one of these chemically stabilizing dopants.
8. The ammonia gas sensor of Claim 7, wherein the chemically stabilizing dopant replaces a portion of a metal in the main material in the sensing electrode.
9. The ammonia gas sensor of Claim 8, wherein the sensing electrode comprises about 0.1 at% to about 5 at% of the chemically stabilizing dopant based on the whole sensing electrode.
10. The ammonia gas sensor of Claim 9, wherein the sensing electrode comprises about 0.3 at% to about 3 at% of the chemically stabilizing dopant.
11. The ammonia gas sensor of Claim 7, wherein the sensing electrode further comprises a diffusion-impeding dopant zinc, zirconium, lead, iron, yttrium, zinc oxide, zirconium oxide, lead oxide, iron oxide, yttrium oxide and combinations comprising at least one of these diffusion-impeding dopants.
12. The ammonia gas sensor of Claim 11, wherein the diffusion-impeding dopant replaces a portion of the electrically conducting material in the sensing electrode.

13. An ammonia gas sensor, comprising:
a reference electrode;
an ammonia selective sensing electrode comprising the reaction product
of

a main material selected from the group consisting of vanadium, and
vanadium oxide; and

an electrically conducting material selected from the group consisting of
bismuth, lead, lanthanum, strontium, calcium, copper, gadolinium, neodymium,
yttrium, samarium, magnesium, magnesium oxide bismuth oxide, lead oxide,
lanthanum oxide, strontium oxide, calcium oxide, copper oxide, gadolinium oxide,
neodymium oxide, yttrium oxide, samarium oxide, and combinations comprising at
least one of the foregoing conducting materials;

a chemically stabilizing dopant selected from the group consisting of
tantalum, magnesium, tantalum oxide, and magnesium oxide, and combinations
comprising at least one of these chemically stabilizing dopants;

a diffusion-impeding dopant zinc, zirconium, lead, iron, yttrium, zinc
oxide, zirconium oxide, lead oxide, iron oxide, yttrium oxide and combinations
comprising at least one of these diffusion-impeding dopants; and

an electrolyte disposed between and in ionic communication with the
sensing electrode and the reference electrode; and

a heater disposed in thermal communication with the electrolyte.

14. The ammonia gas sensor of Claim 13, wherein electrically
conducting material comprises bismuth.

15. The ammonia gas sensor of Claim 13, wherein the main material
and electrically conducting material form a first material selected from the group
consisting of V_2O_5 , $BiVO_4$, WO_3 , MoO_3 , and combinations comprising at least one of
the foregoing first materials.

16. A process for monitoring the concentration of ammonia in a gas stream, the process comprising:

contacting a sensor with the gas stream, the sensor comprising a reference electrode, an ammonia selective sensing electrode, and an electrolyte disposed therebetween, wherein the sensing electrode comprises the reaction product of a main material selected from the group consisting of vanadium, tungsten, molybdenum, vanadium oxides, tungsten oxides, molybdenum oxides, and combinations comprising at least one of the foregoing main materials; and

an electrically conducting material selected from the group consisting of electrically conductive metals, electrically conductive metal oxides, and combinations comprising at least one of the foregoing; and

generating a voltage signal associated with the ammonia concentration.